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LIVER ENZYMES (ALT, AST) IN THE DETECTION OF HEPATITIS HCV, HBV, AND HIV IN HEMODIALYSIS

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Abstract

Background: Hepatic diseases are prevalent among hemodialysis patients, and liver function tests, specifically serum liver enzymes, play an important role in identifying and monitoring these individuals. This study aimed to find ALT reference values in a large group of hemodialysis patients who did not have hepatitis and see how well they could predict the virus in anti-HCV-positive HD patients.

Methods: The study was conducted on 207 people (males: 115, females: 92) on dialysis in the center of Dr. Adel Al-Sabbah in Karbala, Iraq, and serum AST, ALT, ALP, HBsAg, HIV, and HCV values were measured. Our study included the lab tests and clinical outcomes of patients who received hemodialysis for four or three hours, two or three times a week, at the center (Dr. Adel Al-Sabbah in Karbala, Iraq), between September 6, 2021, and March 5, 2022. The collected data was analysed using SPSS version 22.0 and medical version 20.109.

Results: The overall prevalence of hepatitis C infection in hemodialysis patients was 15.9%. The hepatitis B infection rate was 0%. There was a significant correlation between HCV infection and elevated liver enzymes: alanine aminotransferase (ALT), aspartate aminotransferase (AST), (AUC 0.792, P 0.001), and (AUC 0.780, P 0.001), respectively. A statistical relationship between urea and ferritin in HCV patients has not been found (AUC = 0.505, P = 0.921).

Conclusion: Liver enzymes (ALT and AST) were the most indicative of hepatitis viruses. These enzymes are very low in the case of hemodialysis and are not infected with hepatitis. The hepatitis B vaccine played a major role in preventing the spread of the hepatitis B virus. The Hepatitis C virus was common in hemodialysis patients in Karbala. During the study period, no one had HIV, maybe owing to cultural beliefs and behaviors. Blood transfusions, dialysis machines, tools, and other medical equipment used in urgent and emergency care are all possible sources of infection.

Keywords: AST, ALT, ALP, Hepatitis, Hemodialysis and Ferritin

Background

It is estimated that 850 million people worldwide have renal problems caused by various factors. Chronic kidney disease (CKD) is the sixth biggest cause of death, claiming 2.4 million lives annually. Cardiovascular disease, diabetes, hypertension, obesity, and infections including HIV, malaria, TB, and hepatitis contribute to increased morbidity and mortality from CKD and AKI. Furthermore, CKD and AKI in children produce serious morbidity and

mortality and long-term medical issues (Kot et al., 2021). Acute renal failure (ARD) affects about 500,000 people in Sub-Saharan Africa, with most deaths occurring within a year (Ojo, 2014).

33% of those receiving hemodialysis or kidney transplantation had liver disease. 58% of these hepatitis cases showed HBs antigenemia, and 77% of HBsAg-positive individuals were (Loras et al., 2010; Toussaint et al., 1979). Globally, estimates of chronic HCV infection range from 5% to 60%. In the United States, hemodialysis patients had an HCV prevalence five times that of the general population, at roughly 8% (Al-Muramdy, 2020).

Patients on dialysis, especially hemodialysis (HD), are more prone to viral infections. Their cellular immunity renders individuals more vulnerable to infection. The HD procedure also exposes the blood to harmful microorganisms through extracorporeal circulation. HD patients may also need frequent hospitalizations and surgery, increasing the risk of nosocomial infection. Hepatitis B, C, and HIV are the most frequent viral infections seen in HD units (HIV) (Bernieh, 2015; Karkar et al., 2006).

Serum ferritin is an indicator of body iron storage (Lipschitz et al., 1974). In hemodialysis patients, serum ferritin levels above 500ng/ml are associated with atherosclerosis (Cull, 2011). The study found that the risk was higher for people with HD who had baseline ferritin levels of more than 200 ng/ml and those with baseline ferritin levels of more than 800 ng/ml (T. Kim et al., 2017; Majidi et al., 2021).

The role of the hepatitis B vaccine in hemodialysis patients

The Hepatitis B virus replicates inside hepatocytes to disrupt liver function (Hosseini & Yazdani, 2021). The immune system kills liver cells and eliminates the virus during infection (Chisari & Ferrari, 1995; D'souza et al., 2020). Although T cells assist in destroying hepatocytes, non-specific inflammatory cells (white blood cells) may impede or worsen their effect. Moreover, platelet accumulation causes T-cell accumulation in the liver (Kah et al., 2017). The initial test for viral hepatitis usually uses a surface antigen like HbsAg (Shah & Amarapurkar, 2018; Song, 2016).

HBsAg testing is adequate to diagnose HBV infection in most dialysis patients. A negative HBsAg test does not guarantee a negative HBV test (HBsAg, HBc, and HBs) is important for finding hidden viruses. [16], [21], [22]. HBV endemicity is classified as high, midrange, or low. Chronic HBV infection is documented in over 8% of the population in China, South East Asia, Indonesia, and Sub-Saharan Africa (Ott et al., 2012; Song, 2016).

The hepatitis B vaccination proved extremely successful in hemodialysis patients, and efforts should be, increased to utilise it in this patient group; its perfect isolation and immunization resulted in the decrease or disappearance of hepatitis B virus in the centers of hemodialysis patients (Krueger et al., 2020; Miller et al., 1999).

Effect of the Hepatitis B vaccine on hemodialysis patients

The probability of HB viral transmission (direct or indirect) is higher in a crowded hemodialysis facility with many patients. Immunizing unprotected hemodialysis patients against Hepatitis B (Kato et al., 2008; K. W. Kim et al., 2012). Because hemodialysis patients' immune systems are inhibited, vaccination must be adjusted to improve seroconversion rates (Han et al., 2021). At month 7, a 3-dose 60 Ig HB immunization produced significantly better immune responses than a 3-dose 20 Ig vaccination (Feng et al., 2017; Yao et al., 2021). A hepatitis B vaccine at a high dosage (60 Ig) may provide long-term immunogenicity in hemodialysis patients (Yao et al., 2021). Serum HBV seropositivity is now low in patients on maintenance hemodialysis (0–10%), but outbreaks of acute HBV infection continue to occur in this context (Fabrizi et al., 2008). Serum HBV surface antigen (HBsAg) seropositivity ranges from 1% to 20% in hemodialysis patients. However, acute HBV infection outbreaks continue to occur (Ibrahim et

al., 2018). The effect of the vaccine on dialysis patients and workers in dialysis centers had good results in reducing hepatitis B among workers in hospitals and medical centres.

Transmission of the hepatitis C virus within dialysis centers

The global frequency of HCV infection is 3%, with an estimated 170 million people infected. Africa, America, Europe, and Southeast Asia have prevalence rates of under 2.5% (Marinaki et al., 2015; Organization, 1999; Shepard et al., 2005). The latest DOPPS (Dialysis Outcomes and Practice Patterns Study, 2012–2015) found that 9.9% of hemodialysis patients have anti-HCV antibodies (21 countries globally). Anti-HCV antibody prevalence has reduced in several nations during the previous 15 years, including Italy (from roughly 23% to 12%), the US (from 11% to 7%), and Japan (from 7% to 12%). Other nations, including Germany and the UK, saw no change (Fabrizi et al., 2021; Jadoul et al., 2019).

The annual risk of dialysis is estimated to be 2% (Marinaki et al., 2015; Shepard et al., 2005). Most studies found that HCV viral load decreased significantly after hemodialysis, returning to baseline 48 hours later before the next dialysis session (Badalamenti et al., 2003; Furusyo et al., 2000; Marinaki et al., 2015). Similar infection control violations have been identified throughout outbreak investigations, particularly in the cleaning and disinfection of equipment and environmental surfaces, adherence to hand hygiene and glove use, vascular access management, and drug preparation and delivery (Nguyen et al., 2019; Thompson et al., 2009). Significant causes of small or cluttered treatment areas with space limitations and separation between dialysis stations have been identified as quick shift changes and rushed treatment schedules that don't afford enough time for cleaning and disinfection, significant staff turnover, and employees who aren't trained on infection control ((CDC, 2009; Nguyen et al., 2019).

The Spread of HIV Among Dialysis Patients

In 2019, the United Nations Program on HIV (UNAIDS) reported 38 million HIV infections and 690,000 AIDS deaths (Cavalcante et al., 2021). HIV infects key immune cells such as helper T cells (particularly CD4+ T cells), macrophages, and dendritic cells (Germic et al., 2019). In a study conducted in Iraq and Baghdad between 2015 and 2017, HIV was not detected in these patients (Kamal & Mahdi, 2018). As a result, there are reasons to believe that Islamic societies will have lower rates of HIV prevalence than non-Islamic cultures. International testing backed this up (Shishkina et al., 2014). Because Iraq is considered one of the Islamic countries in which the spread of the AIDS virus is reduced. Therefore, the virus spread among dialysis patients is reduced or completely absent.

Methods

Equipment and materials

MINI VIDAS.

Analyzers Cobas c 111

ELISA stands for Enzyme-Linked Immunoassay

Fortress Diagnostics (HIV/HCV/HBsAg)

Patients

Our study included the lab tests and demographic and clinical data of patients who received hemodialysis for four hours three times a week or twice a week at the center (Dr. Adel Al-Sabbah in Karbala, Iraq) between September 6, 2021, and March 5, 2022. Between 18 and 65, the patients represented a diverse population. Patients Exclusion Patients who have not completed the hepatitis B immunization procedure are considered non-compliant. The Department of Health in Karbala's institutional review panels approved the research to proceed.

Laboratory

The results of the laboratory tests were performed before the start of the chronic hemodialysis program for these patients. Urea and creatinine levels in the blood and ALP, ALT, AST, HCV, and HBsAg concentrations. Additionally, thorough blood cell and biochemistry analyses were performed using automated and standardized procedures.

Hemodialysis Process

B. Braun, dialysis treatment for patients resulted in the Hemodialysis System. The comprehensive and efficient treatment system of the Dialog+ hemodialysis system allows users to personalise patient dialysis treatments. Adina Treatment Profiling-UF, Na, Bicarb; Temperature; Dialysate Flow; PULSE; and Heparin parameters may be profiled for particular patients.

Statistical study

SPSS statistical software and medical software were used to analyse the categorical data. Standard deviations, ROC, and T-test of age, serum AST, ALT, Ferritin, Serum Creatinine, B.Urea, and ALP, were calculated in all the two groups (Uninfected and Infected hepatitis C). level of the p-value (p 0.05) significance level.

Results

Reviewed patients' data and conducted the necessary tests for 207 dialysis patients on, dialysis There were 115 women and 92 men among them. The patients were aged 18–to 65 years.

Table 1 The ratio of males and females

sex	Freq.	Percent	Cum.
Male	115	55.56	55.56
Female	92	44.44	100.00
Total	207	100.00	

Table 2 Criterion Values and Coordinates Of The Roc Curve

	Criterion	Sensitivity	95% CI	Specificity	95% CI	+LR	-LR
ALT	>20.8	72.73	54.5 - 86.7	85.06	78.9 - 90.0	4.87	0.32
AST	>22.1	66.67	48.2 - 82.0	87.36	81.5 - 91.9	5.27	0.38
ALP	>139	57.58	39.2 - 74.5	57.47	49.8 - 64.9	1.35	0.74
B.Urea	≤129	72.73	54.5 - 86.7	48.85	41.2 - 56.5	1.42	0.56
S.Creatinine	≤8.3	72.73	54.5 - 86.7	51.15	43.5 - 58.8	1.49	0.53
S.Ferritin	≤715	96.97	84.2 - 99.9	13.22	8.6 - 19.2	1.12	0.23

The prevalence of the hepatitis C virus was common among dialysis patients. The ALT criterion is more than >20.8, the sensitivity is 72.73, and the specificity is 85.06, which indicates the above test in hemodialysis patients (**Table 2**). The AST criterion is more than >22.1, the sensitivity is 66.67, and the specificity is 87.36. This indicates that the above test in hemodialysis patients is one of the good parameters in diagnosing (Table 1). However, the sensitivity and specificity of tests (ALP, B.Urea, S.Creatinine, and S.Ferritin) were 57.58, 72.73, 72.73, 96.97, and 57.47, 48.85, 51.15, 13.22, respectively (**Table 2**).

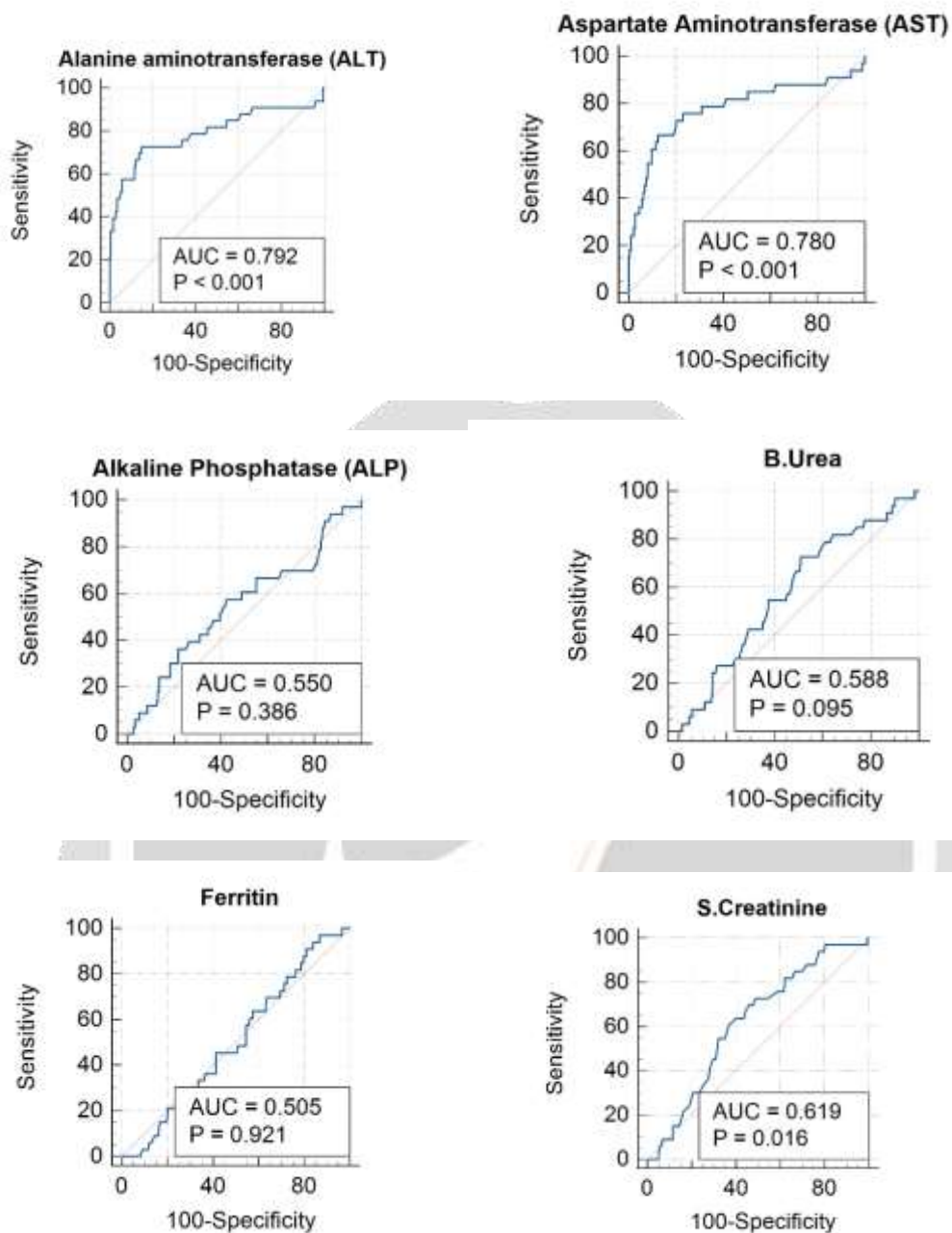


Figure 1 Criterion Values and Coordinates Of The Roc Curve

It shows specificity ALT and AST (85.06, 87.36) respectively, and sensitivity ALT and AST (72.73, 66.67) respectively, which indicates that stitch indicates the presence of viral hepatitis (**Figure 1**).

Table 3 Infected and non-infected with hepatitis C virus with some parameters.

	Hepatitis C viral	Obs	mean±SD	Std. Err	p-value	95% Conf. Interval	
B.Urea	Uninfected	174	129.37±40.52	3.07	0.170**	123.31	135.44
	Infected	33	118.96±36.25	6.31		106.11	131.82

S.Creatinine	Uninfected	174	8.49±2.44	0.18	0.056**	8.13	8.86
	Infected	33	7.62±2.10	0.36		6.88	8.37
AST	Uninfected	174	16.07±10.66	0.80	0.000*	14.47	17.66
	Infected	33	48.79±62.53	10.88		26.62	70.97
ALT	Uninfected	174	12.90±10.05	0.76	0.000*	11.40	14.41
	Infected	33	58.12±66.48	11.57		34.55	81.69
ALP	Uninfected	174	167.35±174.69	13.24	0.848**	141.21	193.49
	Infected	33	173.42±116.30	20.24		132.18	214.66
Ferritin	Uninfected	174	318.23±348.44	26.41	0.430**	266.09	370.36
	Infected	33	267.75±262.51	45.69		174.67	360.84

Alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP),

*p<0.05 (Statistically significant) T-test

**p>0.05 (Statistically insignificant) T-test

The above table shows that the two tests (ALT and AST) were 0.000 and 0.000, respectively, statistically significant between chronic liver patients on dialysis and those without hepatitis. (B. Urea, S. Creatinine, ALP, Ferritin) were 0.170, 0.056, 0.848, and 0.430, respectively. The tests show their mystical significance among patients infected with hepatitis C (Table 2).

Previous illustrations indicate the sensitivity and high specificity of the tests (AST, ALT) in (Table 1) and (Table 2) when we performed the t-test, which showed the statistical relationship between hepatitis C patients and non-infected (AST, ALT) at 0.000 and 0.000, respectively. As for the remaining tests (B. Urea, S. Creatinine, ALP, Ferritin), there was no statistical relationship in (Table 2) as well as (Fig. 1) (AST, ALT), (AUC 0.78, 0.79), and p 0.00, p 0.00, respectively. A classifier corresponding to a larger AUC has a better effect (B. Urea, S. Creatinine), ALP, or Ferritin. The ROC curve does not indicate which classifier has the best effect.

Discussion

According to the Centers for Disease Control and Prevention (CDC), viral infections such as HBV, HCV, and HIV pose significant health risks to dialysis patients and medical professionals working in dialysis units and centers. In a study on the Middle East. The prevalence of HBsAg is decreasing. With widespread universal hepatitis B vaccination, the region went from high intermediate endemicity to low intermediate endemicity and, in some cases, zero endemicity. However, it is plausible that the battles in the area may have disrupted the effective immunize immunizations. The region's HBsAg genotype is D (Gençdal & Yurdaydin, 2021). The Dialysis Center highlights the processes for immunization and follow-up properly. Among the patients studied, the prevalence of HBV was 0%. Research similar to ours in Iran On hemodialysis and kidney transplantation from January 2016 to December 2017. After blood sampling, no patients had HBV (Hatatian et al., 2020). The incidence of infection in the center was rare even before our study. A study consistent with ours was conducted from 1st March 2018 to 31st November 2018. Among 216 HD patients, HBsAg was detected in one (0.46%) patient, Diwaniyah, in Iraq (Ala'a Hadi Alessami, 2021). In a study that is inconsistent with our study in Al Anbar Governorate from September 2019 to January 2020, During the research period, 245 hemodialysis patients were included, with a (5.3%) HBV infection rate (Abdulwahab et al., 2021). In 2018, two dialysis clinics in Quetta, Pakistan, were studied. Among the 118 individuals tested, 18 (15.3%) had HBV (Lodhi et al., 2019). In a study in Al Yemen, 150 hemodialysis patients were included, with a 42.76% HBV infection rate (El-Morsy et al., 2022). Our results showed that the hepatitis B virus is rare in dialysis patients and medical workers because most medical workers were vaccinated and dialysis patients.

In the AIDS disease, the number of infections is very low because in Iraq, one of the Islamic countries, reviving religion as a way of life, including human interactions, is an excellent technique for combating HIV/AIDS (Mahfud, 2020). Research similar to ours in Iran From January 2016 through December 2017. In addition, no HIV in hemodialysis patients was found in blood samples (Hatatian et al., 2020). Furthermore, the Ministry of Health spreads awareness measures throughout the country. Therefore, spreading awareness among patients with dialysis means it is rare to find AIDS among dialysis patients.

Using HCV isolation stations for HCV-positive patients did not reduce seroconversion rates. Overall, hemodialysis patients had a lower frequency of HCV than the overall population, notwithstanding this trend. High rates of HCV seroconversion in a subgroup of hemodialysis units may contribute to this difference (Jadoul et al., 2019). A study in the Netherlands in Dec. 2016 saw the seroconversion of two Dutch dialysis patients to HCV in The Hague. There were three likely index instances of chronic HCV infection found. A careful review of medical records uncovered two possible HCV transmission incidents: The venous pressure-sensing port was contaminated due to high venous pressures or insufficient infection control precautions by the unit staff during the handling of two incidents that occurred simultaneously in a single hemodialysis session with the index patient and both incident cases present (Heikens et al., 2019). Research In 2018, two dialysis clinics in Quetta, Pakistan, were studied. Among the 118 individuals tested, 52 (44.1 %) had HCV (Lodhi et al., 2019). A 500-page study and investigation In 2018, two dialysis clinics in Quetta, Pakistan, were studied. Among the 118 individuals tested, 52 (44.1%) had HCV eighty-eight studies (35 Bangladesh, 6 Bhutan, 2 DPR Korea, 323 India, 43 Indonesia, 2 Maldives, 18 Myanmar, 29 Nepal, 11 Sri Lanka, 67 Thailand, and 2 Timor-Leste). SEAR estimated the hemodialysis-weighted pooled anti-HCV seroprevalence to be 8.39 per cent (5.84–11.51) (Goel et al., 2022). Research in Kosovo's Health found 72 samples (19.05%) were HCV positive out of 387 tested. The majority were in hemodialysis centers (Rashiti-Bytyci et al., 2022). In the study, in a hospital in south India, Among the 100 samples in hemodialysis, only one was positive for HCV antibody by ELISA. Eight samples were positive for HCV RNA by PCR (Madhavan et al., 2020).

In our study, individuals with hepatitis C had higher ALT and AST levels than those without hepatitis C. In a study conducted over three years, people with CKD were diagnosed clinically and biochemically between January 2015 and December 2017. They had the hepatitis virus. Hepatitis C-positive CKD patients showed higher ALT activity, although AST and ALP levels were similar (Ogunleye et al., 2020). Study HCV infection in children in Beni-Suef Governorate and identify risk variables. ALT and AST values were measured in youngsters aged 6-17 years. ALT and AST were greater in HCVAb and PCR-positive subjects than in negative ones (Abdel Megeed et al., 2022).

Conclusions

The prevalence of HBV, HCV, and HIV among hemodialysis patients is known. Our study was Iraq-Karbala Governorate. for six months, every two months, We did several tests on HD patients in the center who did not contract the hepatitis virus or HIV sickness. Liver enzymes (ALT and AST) were the most indicative of hepatitis viruses. These enzymes are very low in the case of hemodialysis and are not infected with hepatitis. The research was conducted in the center's laboratory, and the data was collected from the medical statistics of the same center. The hepatitis B vaccine played a major role in the absence of the spread of the hepatitis B virus. The Hepatitis C virus was common in hemodialysis patients in Karbala. No one in the study had HIV, Maybe owing to cultural beliefs and behaviors. Transfusions, dialysis machines, tools, and other contaminated equipment can now infect patients with HBV, HCV, and HIV, causing serious viral infections. It is critical to raise public knowledge of viral infections and adopt adequate screening protocols before dialysis for healthcare providers and patients.

Availability of data and materials

All the data generated or analysed during this study is available in this article.

Abbreviations

HIV/AIDS: Human Immunodeficiency Virus

HCV: Hepatitis C virus

HBsAg:	Hepatitis B Surface Antigen
AST:	Aspartate Aminotransferase
ALT:	Alanine Aminotransferase
ALP:	Alkaline Phosphatase
HD:	Hemodialysis
HBV:	Hepatitis B virus

Ethical approval

Approvals were taken from the Dialysis Department and the Karbala Health Department / Iraq.

The study was conducted in compliance with Iraq and global ethical and privacy regulations, as well as the World Medical Association's Declaration of Helsinki. Furthermore, it should be noted that our Institutional Review Board (IRB) strictly adheres to the International Guideline for the Protection of Human Subjects in Research, as mandated by the Declaration of Helsinki, The Belmont Report, the CIOMS Guideline, and the International Conference on Harmonisation of Good Clinical Practise (ICH-GCP).

Conflict of interest

None

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